

For amputees, an unlikely painkiller: Mirrors
By Sandra Young
CNN

WASHINGTON (CNN) -- Army Sgt. Nick Paupore was in the lead Humvee in a convoy rolling through Kirkuk City, Iraq, when the vehicle was hit by a roadside bomb.

Paupore says it wasn't a very big explosion, more like a loud firecracker. He could feel the rush going through the vehicle, the change of pressure, smoke filling the cab. He felt a burning sensation in the back of his legs, but he wasn't in pain, and he could actually move his legs. He felt lucky. He was alive. He got out of the vehicle, intending to help the others, and passed out.

When he regained consciousness, medics were working on him. The blast had ripped out a chunk of his leg, including 6 to 8 inches of an artery, and he was bleeding out. By the time they had stanced the flow, he had less than two pints of blood left. The average person has 10 pints of blood.

Paupore was flown to Germany, where doctors fought to save his life. He survived, but they couldn't save his leg.

And he was in excruciating pain -- in the leg he no longer had.

Dr. Jack Tsao, a Navy neurologist with the Uniform Services University, was looking for ways to help soldiers like Paupore. He remembered reading a paper in graduate school that talked about an unusual treatment for amputees suffering "phantom limb pain," using a simple \$20 mirror.

The mirror tricks the brain into "seeing" the amputated leg, overriding mismatched nerve signals. Here's how it works: The patient sits on a flat surface with his or her remaining leg straight out and then puts a 6-foot mirror lengthwise facing the limb. The patient moves the leg, flexing it, and watches the movement in the mirror. The reflection creates the illusion of two legs moving together.

Paupore was one of the first to give it a try. At first, he was skeptical. When approached about joining a clinical trial at Walter Reed Army Medical Center to test Tsao's theory, he declined. But sometimes his phantom pains were coming five to six times an hour and lasting up to a minute.

"I was laying in bed and it just, all of a sudden, it felt like I was getting shocked," he said. "I called the nurse, 'cause I was like, 'What's going on?' " The nurse told him, "This is probably your phantom pain."

Tsao explains it this way: "It's the sensation that the limb is still present, and phantom pain in particular is the sensation that the limb is experiencing pain of some form."

That pain is intense, and often medication brings very little relief. For Paupore, it was relentless. "All of a sudden, it was like someone kept turning on and off the Taser, and my whole leg started twitching. ... I sat up, and I was holding on to my stump, and it just wouldn't stop. At that time, I was hooked up to the Dilaudid [a powerful narcotic], and I was pushing it. But you can push all the medicine in the world, and it won't stop it."

Paupore and 17 other amputees who joined Tsao's mirror therapy trial were randomly assigned to one of three groups. The first group used the mirror to look at their reflected image as they tried to move both legs. The second group used a covered mirror and did the same. And members of the third group were asked to visualize moving their amputated limbs.

After a month of treatment, all of the patients in the mirror group had significantly less phantom pain. In the covered mirror group, only one patient experienced a decrease in pain, and for half of those patients, the pain worsened. Sixty-seven percent of the patients visualizing their limbs got worse instead of better. The pain decreased in almost 90 percent of the patients who then switched to mirror therapy.

It worked wonders for Paupore, 32. Within five months, he was off painkillers completely. Tsao says the difference is like night and day.

"To see him walking, he's able to drive his car; he works downtown; I mean, that is incredibly gratifying!" Phantom limb pain plagues as many as 95 percent of amputees, Tsao said.

He says even though phantom pain dates to Civil War days, no one knows what causes it. The current thinking is that it has to do with how the brain interprets signals from the pain pathways that are left after amputation.

The neurons that control leg movement are still there, but in the absence of a limb, they are not sure what they're suppose to do and begin firing randomly. Proprioception, the body's ability to sense the position of a limb, tells the body that the limb is still there, sending mismatched signals to the brain.

"The visual neurons are still intact, and they're firing off, telling the brain one thing," Tsao said. "The proprioceptive neurons are firing off, telling the brain something else. ...My thinking is that there is some sort of center in the brain that coordinates these signals. ... Somehow, this mismatched feedback is what's generating the sensation that the limb is frozen or in pain."

Since the conflicts in Afghanistan and Iraq began, more than 750 amputees have returned home from that area. Walter Reed has treated more than 550 of them. On any given day, between 100 and 125 amputees are there, working to rebuild their lives.

At Reed, mirror therapy is now offered routinely. Tsao says this treatment has the potential to benefit amputees worldwide, and the best part is, no special training is required to do it. He gives interested parties instructions over the phone or by e-mail.

And he's already taken this therapy halfway around the world to Cambodia, a country Tsao says has a large and growing amputee population because of mines left over from its civil war.

<http://www.cnn.com/2008/HEALTH/03/19/mirror.therapy/index.html>